Grand Canyon

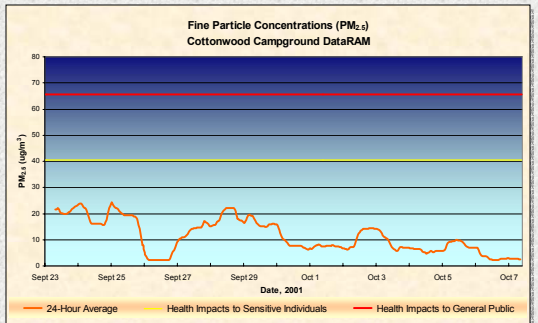
National Park Service
US Department of the Interior

Grand Canyon National Park
Arizona

Fire Management Plan
Smoke Management

Issues

- Many forests in Grand Canyon National Park depend on fire, so restoring fire to its natural role is imperative.
- Wildland fires can, and do, produce unacceptable air quality impacts.
- Air quality in the Park is regulated by the Arizona Department of Environmental Quality, under the federal Clean Air Act.
- As a Class I airshed, Grand Canyon N.P. receives the most stringent protection against increases in air pollution.
- Although wood smoke is mostly water vapor, it contains many pollutants, including carbon monoxide, various organic compounds and fine particles.
- Dangerous exposures to carbon monoxide may occur in continuous, close proximity to the fire line itself.
- Park staff concentrates overall smoke management efforts on fine particles and their impacts.
  - There are two categories of smoke impacts: human health and visibility.



Although the "Vista Fire" did not exceed EPA standards for $PM_{2.5}$, fire staff issued a press release warning of heavy smoke to ensure visitor safety.

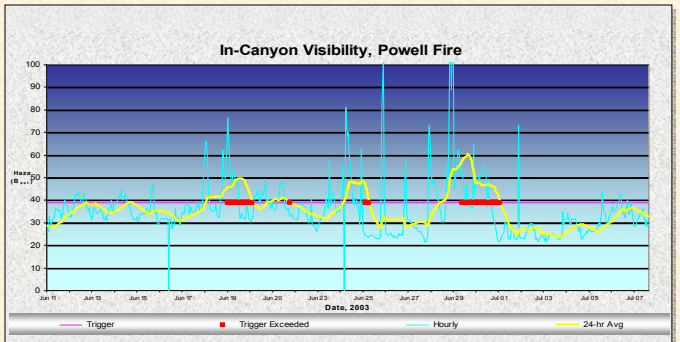
Human Health

- The U.S. Environmental Protection Agency (EPA) sets standards to protect human health from fine particles ($PM_{2.5}$), including those in smoke.
- The National Park Service uses portable monitors to assess $PM_{2.5}$ concentrations during large fires.
- No violations of EPA standards in the Park have been recorded during wildland fires.
- Actual fire management goals are set well below the EPA standards to allow a margin of safety for visitors and residents.
- Press releases are issued to advise visitors and residents of heavy smoke even if $PM_{2.5}$ levels do not exceed EPA's thresholds.

A portable fine particle monitor

Visibility

- Visibility is our ability to see through the air, and is influenced by lighting, weather, season, and air pollution.
- Most haze in Grand Canyon is the result of fine particles ($PM_{2.5}$).
- The National Park Service uses a transmissometer to measure haze levels (including smoke) every hour.
- Some smoke in the Grand Canyon is an inevitable result of fire. Our goal is to minimize smoke's impacts.
- EPA's strategy to improve visibility is to "clean up" the haziest 20% of the time.
- If smoke causes 24-hour haze averages to stay in the haziest 20% all day, fire managers evaluate and take action to reduce smoke levels.



Even a "well behaved" natural fire may occasionally exceed 24-hour haze trigger points. Each exceedence (red bars) was evaluated for options to reduce smoke levels in Grand Canyon.

This transmissometer receiver measures light projected from the floor of Grand Canyon.

Management Constraints

- Although fires can be managed to some degree, their behavior is inherently unpredictable.
  - Air quality monitoring provides specific data, but only at the equipment's location and at the measurement time. These data must be combined with "real world" observations and predictions to guide fire management.
- Not all air quality monitoring equipment is available or suitable for all fires.
- Smoke from unwanted wildland fires can not be managed, and tend to produce more smoke than managed fires.
- Prescribed fire allows managers to manage smoke impacts by manipulating:
  - Smoke production through fuel loads, acreage burned, fire intensity
  - Smoke dispersion through ignition timing, predicted weather conditions
- The State of Arizona issues burning permits under Article 15, Range and Forest Burning (AAC R18-2-15). Smoke management requirements are derived from the Clean Air Act, as reflected in the:
  - Regional Haze Rule,
  - EPA Interim Air Quality Policy on Wildland and Prescribed Fires,
  - Western Regional Air Partnership Policies on Fire Tracking Systems, Enhanced Smoke Management Programs for Visibility, and Annual Emission Goals for Fire.

The goal of an effective smoke management program is to avoid unacceptable smoke impacts to Grand Canyon, and return smoke levels to the natural levels found in a healthy, functioning ecosystem.